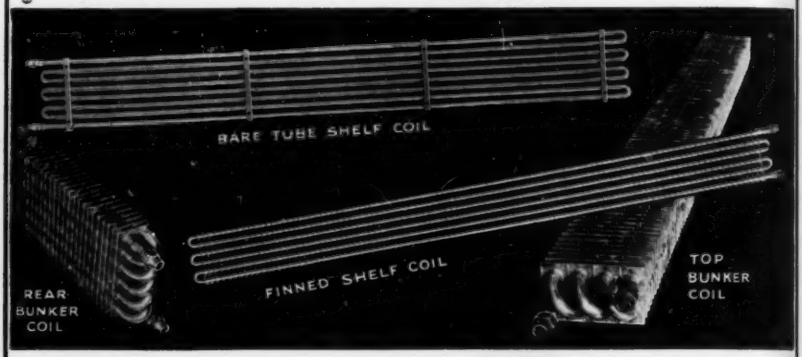
The Refrigeration Service Engineer

Vol. 1
No. 5

OCTOBER • 1933

The Leonard Refrigerator—Shaft Sealing—
Thermostatic Valve in Commercial Refrigeration
Practical Service Pointers—The Question Box

Kramer Announces "Shelf" Evaporators !



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Devoted to the Servicing of
REFRIGERATION UNITS *and* OIL BURNERS

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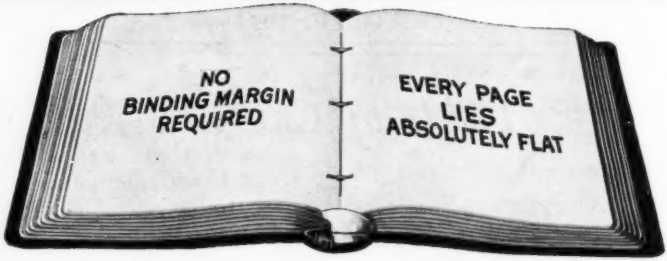

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The Refrigeration Service Engineer

A Monthly Illustrated Journal Devoted to the Interests of the Refrigeration Service Engineer in the Servicing of Domestic and Small Commercial Refrigeration Systems and Oil Burners

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VOL. 1, NO. 5 CHICAGO, OCTOBER, 1933 $2.00 per Annum

The Leonard Refrigerator

Construction Details and Service Suggestions.
Symptoms of Improper Operation and the Remedy.
Diagram of Compressor, Seal and Other Parts.

THE Leonard refrigerating unit, although one of the newer makes to enter the field, has met with remarkable acceptance by the public, with the result that there are many thousands of Leonard units now operating in various sections of the country.

For the benefit of the service engineer who may not have had knowledge or experience in the servicing of this particular electric refrigerator, information in reference to same, with pointers on servicing, are given herewith to be followed with further information on the apparatus to be published in future issues of this magazine.

The Compressor

One series of Leonard compressors made in different models has been used—C (1¼ in. bore x 1½ in. stroke)—A type (one cylinder) and B type (two cylinder) as shown in Fig. 1. This is of the one or two cylinder, vertical, reciprocating, single acting type, embodying a number of features that, it is claimed, result in quietness, efficiency and long life. The refrigerant used by Leonard is sulphur dioxide.

Leakage of the refrigerant past the crankshaft is prevented by means of a seal which is of the bellows type. The seal ring is held up against the shoulder on the crankshaft by the seal spring and forms a gas-tight seal. The other end of the seal is gasketed. Two types of seals have been used—the present "balanced" type (Fig. 2) and its predecessor (Fig. 3). By a balanced seal is meant that the pressure of the refrigerant in the crankcase does not have any effect on the sealing action.

Inefficiency

Both suction and discharge valves must not leak to have the system function properly. If they do, the compressor will be inefficient, resulting in one or more of the following symptoms:

Normal refrigeration with the Leonard running too much or continuously. Poor or no refrigeration with the Leonard running continuously. Inability to freeze ice cubes fast enough or not at all. The compressor efficiency may be definitely checked as follows:

The compressor should be warm when testing its efficiency, as a cold compressor is not operating at its greatest efficiency due to loose fit of the pistons.

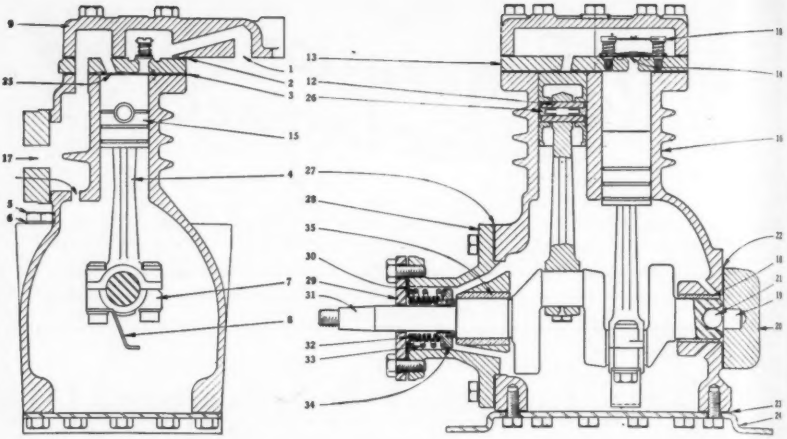


FIG. 1—MODEL CB COMPRESSOR (MODEL CA COMPRESSOR HAS ONE CYLINDER

1. Discharge Port.
2. Cylinder Head Gasket.
3. Valve Plate Gasket.
4. Connecting Rod.
5. Oil Plug.
6. Oil Plug Gasket.
7. Connecting Rod Cap.
8. Oil Dipper.
9. Cylinder Head.
10. Discharge Valve Guide.
11. Crankcase Port.
12. Piston Pin.
13. Valve Plate.
14. Discharge Valve.
15. Piston.
16. Cylinder Block.
17. Entrance Port.
18. Crankshaft Inner Bushing.
19. Crankshaft Thrust Ball Seat.
20. Crankshaft Thrust Plate.
21. Crankshaft Thrust Ball.
22. Crankshaft Thrust Plate Gasket.
23. Base Gasket.
24. Base.
25. Suction Valve.
26. Piston Pin Button.
27. Crankcase Cover Gasket.
28. Crankcase Cover.
29. Seal Cover.
30. Seal Gasket.
31. Crankshaft.
32. Seal Bellows.
33. Seal Spring.
34. Seal Guide.
35. Crankshaft Outer Bushing.

1. Turn the compressor over by hand. A definite compression should be noted, but upon turning over the top of the compression stroke there should be no tendency to follow around. If the compressor does follow around it shows that the discharge valves are leaking.

2. As a further test, close in the compressor suction service valve.

3. Start the motor and pump a vacuum with as little oil pumping as possible. The rapidity with which the compressor can pump this vacuum further determines its efficiency. In general, a good compressor will pull down to 26 in.—29 in. vacuum if pumping oil or 28 in.—27 in. vacuum if not pumping oil.

The Remedy—Reseat the compressor valves.

Valves

Reseating—It is suggested when reseating the compressor valves that both the discharge and suction valves be reseated to secure greatest efficiency.

1. Turn in the compressor suction service valve, start the motor and draw as good a vacuum as possible. Then stop the motor.

2. Balance the pressure in the compressor by cracking the compressor suction service valve.

3. Remove the compressor discharge service valve.

4. Remove the cylinder head and valve plate.

5. Disassemble the discharge valve assembly.

6. Put a quantity of valve polishing mixture on the discharge valve seat. Use a polishing mixture of Leonard Oil and Bon Ami.

7. Polish the discharge valve seats by turning the valve plate face down on Lapping Plate, Part No. 21087, and rotating it.

8. Disassemble the suction valve assembly.

To disassemble the suction valves in Models CA10-12 and CB22, the compressor must be removed from the condensing unit base and then the compressor base, connecting rods and pistons removed from the compressor.

9. Put a quantity of valve polishing mixture on the suction valve seats. Use a polishing mixture of Leonard Oil and Bon Ami.

10. Polish the suction valve seats.

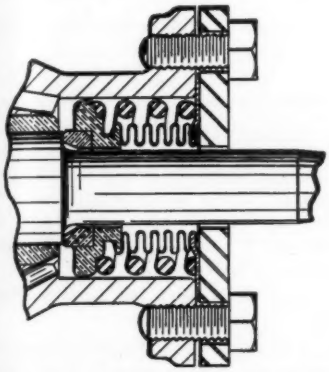


FIG. 2—BALANCED COMPRESSOR SEAL

To polish the valve seats of Models CA10-12 and CB22, turn the piston face down on Lapping Plate Part No. 21087 and rotate it. To polish the valve seats of Models CA530 on, and CB510 on, turn the suction valve plate face down on Lapping Plate Part No. 21087 and rotate it.

11. Carefully clean all parts with carbon tetrachloride and assemble the compressor, using new gaskets and other parts where necessary.

In reassembling, be careful—Not to use a valve on which the slightest scratch appears.

To assemble the valves with the burred side away from the seat.

To assemble the parts properly mated.

Noisy

Symptoms—The ordinary noisy discharge valve makes a clicking noise, while a stuck shut valve or a valve of insufficient life makes a dull thud. Also with a stuck shut valve the walls of the cylinder will be warm.

Remedy—Check the lift of the valve and reseat if necessary according to the directions under Valves and Reseating. Noisy discharge valves are usually caused by insufficient or too much lift.

Seal—Reseating

1. Remove the compressor pulley. To do this use Compressor Pulley Puller Part No. 21275.

2. Remove the oil from the compressor by removing the oil plug.

3. Remove the seal cover, seal and crankcase cover.

4. Test the seal bellows for leaks. To do this, place the seal downward on a flat piece of rubber, such as an old inner tube, and fill the bellows full of gasoline. Moderate pressure with the hand on a flat piece of rubber, such as an old inner tube, on the top will force gasoline through any leaks.

5. If the seal seat surface on the crankshaft is badly scored, it must be removed from the compressor, put in a lathe and a grinding wheel used on it.

If the seal seat surface is slightly scored, place a Compressor Seal Seat Lapping Paper Part No. 21361 against the seal seat surface of the crankshaft and then Compressor Seal Seat Lapping Tool Part No. 21356.

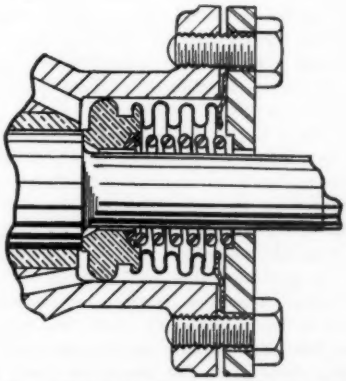


FIG. 3—UNBALANCED COMPRESSOR SEAL

6. Lap the crankshaft by rotating by hand the lapping tool against the shoulder of the crankshaft.

7. Put a piece No. 00 sandpaper face up on Lapping Plate Part No. 21087 and reface the seal ring by rotating it on the

sandpaper. New seals do not need to be refaced.

8. Put a quantity of seal polishing mixture on the seal ring. Use a polishing mixture of Leonard Oil and Lapping Rouge Part No. 100107.

9. Polish the seal face by turning it face down on Lapping Plate Part No. 21087 and rotating it. New seals do not need to be lapped.

10. Carefully clean all parts with carbon tetrachloride and assemble the compressor, using new gaskets where necessary. In assembling the compressor, fill it with the proper amount of Leonard oil and be particularly careful to thoroughly oil the seat of the seal.

Other Noises

Symptoms—A squealing and squeaking noise.

Remedy—1. Reverse the direction of rotation of the motor for about one-half hour, then run the compressor in the usual direction. To reverse the direction of rotation of a direct current motor, interchange the two motor leads. To reverse the direction of an alternating current motor, shift the brushes by loosening the brush holder plate and shifting it to line up with the other notch on the end plate. The capacitor alternating current motor cannot be reversed in direction. If this doesn't correct the trouble, proceed as follows:

2. Check the oil in the base. When opening the compressor crankcase to the air the pressure should be balanced and afterwards purged. If the compressor is dry, add Leonard oil. If after checking the oil charge the seal still squeaks—

3. Reseat the seal according to the directions, Seal-Reseating. Before reassembling check to see if the inside of the seal guide ring has been rubbing against the crankshaft. This will also cause the seal to squeak. If this happens, pack the inside of the seal bellows with grease.

Replacing—Whether or not the seal must be reseated when using a new seal depends on the condition of the seal and crankshaft. When replacing an unbalanced seal with the balanced seal it is not necessary to lap the seal to the crankshaft, but it is necessary to lap the crankshaft according to the Reseating instructions.

Stuck Up

Symptoms—A corroded compressor that cannot be turned.

Remedy—1. Discharge the system.

2. Removing the cooling unit, liquid and suction lines and condensing unit and install new ones.

3. Completely disassemble the various parts and clean them.

Loose Connecting Rod, Piston Pin or Crankshaft

Symptoms—Place a screw driver against the crankcase, the ear against the end of the handle and listen for a knock inside the compressor. It will not be possible to tell exactly which part is loose until the compressor is disassembled.

Remedy—1. Remove the discharge valve plate.

2. Start the motor and press down on the top of the piston with a finger. A loose connecting rod or piston pin can be felt at each stroke of the piston.

3. Remove the base and test for a loose connecting rod. Place a finger against the connecting rod and the shoulder of the crankshaft adjoining it, place the crankshaft so that the piston is at the middle of its stroke. Then turn the crankshaft a very little back and forth and note if there is any play.

To tighten a connecting rod bushing, file with a fine mill file the face of the cap so that the cap can be drawn up tighter.

4. Remove the connecting rod and piston from the compressor and test for a loose piston pin as follows: Remove all oil possible from around the piston pin. Then hold the piston in one hand and swing the connecting rod sideways and note if there is any movement of the pin in the piston. If the piston pin is loose, replace it with a .003 in. or .005 in. oversize pin.

5. Check the crankshaft for play. If the crankshaft bushings or cylinder block are worn it will be necessary to send the cylinder block to the factory for repairs.

Oil—Overcharge

Symptoms—A dull thump or knock in the compressor. This is known as oil pumping.

Excessive oil in the crankcase.

Remedy—Oil pumping occurs infrequently and usually corrects itself. If the pumping is too persistent, check the oil in the crankcase and if it is excessive some should be removed. When opening the crankcase to the air, the pressure should be balanced and afterward purged.

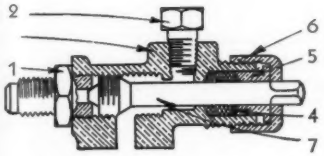


FIG. 4

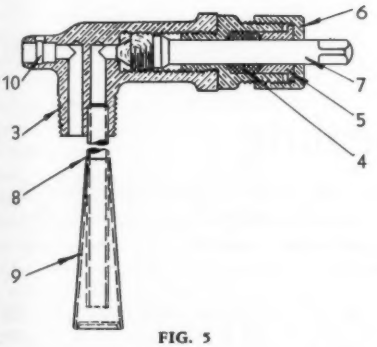


FIG. 5

1. Valve Seat.
2. Gauge or Fitting Hole.
3. Body.
4. Packing.
5. Packing Gland.
6. Packing Nut.
7. Valve.
8. Tube.
9. Strainer.

Oil—Undercharge

Symptoms—A squeaking, thumping, hammering or clanking noise.

Insufficient oil in the crankcase.

Remedy—Fill the crankcase with the proper charge of oil. The oil level should be 1½ in. When opening the crankcase to the air, the pressure should be balanced and afterwards purged.

Tight

Symptoms—One or both of the following: Excessively hot compressor and also possibly the overload protection (fuse or overload coil) blown.

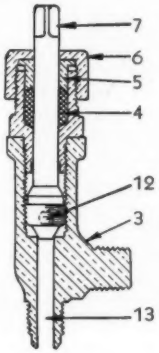


FIG. 6

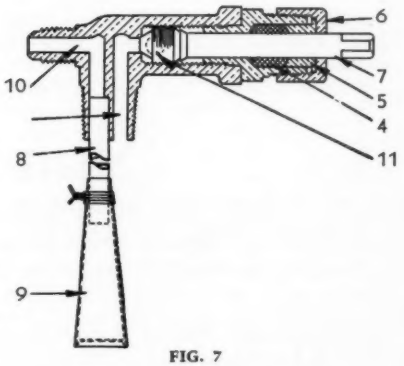


FIG. 7

10. Condenser Connection.
11. Purging Connection.
12. Liquid Line Connection.
13. Liquid Receiver Connection.

Turn the compressor by hand and note if it turns hard. Do not mistake good compression for a tight compressor. If in doubt, draw a vacuum on the compressor by turning in the compressor suction valve before testing for a tight compressor.

Compressors are run in at the factory to a definite point but because of close fits there may be tight spots. If the cylinder

head or seal cover has been removed and not replaced carefully by tightening the screws evenly, a tight compressor can result.

Remedy—1. Remove the compressor.

2. Install another compressor.

3. Run in some more the tight compressor at the service shop.

Service Valve

Service valves are provided on condensing units for simplifying installation and service operations and are located as follows:

Compressor Suction Service Valve (Fig. 4).—This service valve is located on the side of the compressor cylinder block. It controls the inlet of the refrigerant from the suction line to the compressor.

Compressor Discharge Service Valve (Fig. 4).—This service valve is located on the compressor head. It controls the outlet of the refrigerant from the compressor to the condenser.

Liquid Receiver Service Valve.—This service valve is located on the liquid receiver. It controls the outlet of the refrigerant from the liquid receiver to the liquid line. Figs. 5 and 6 show the general types of service valves that have been used.

Purging Service Valve (Fig. 7).—This service valve is located on the liquid receiver. It is used to purge units.

Service valves are of the one-way or two-way type. The two-way type, such as is shown in Fig. 4, controls two outlets from the service valve, while the one-way type, such as is shown in Fig. 7, controls but one outlet.

The following should be remembered when using service valves:

Whenever the pipe plug, gauge or fitting is removed from or installed in a service valve, the valve should be all the way out.

When a gauge is in a service valve, the service valve should be turned in one turn.

When the unit is in normal operation, the valve should be out. In other words, never leave the valve in a neutral position.

Repacking

When repacking a service valve it is necessary, of course, to isolate the refrigerant from it.

1. Turn out the valve.

2. Remove the packing nut, packing gland and packing. To remove the packing it is necessary to use a sharp pick.

3. Reassemble the valve, using new packing.

Shaft Sealing

The Mechanical Household Refrigerator has made necessary the Development of a Positive Trouble-free Sealing Device. Simplicity, Ruggedness, Dependability and Ease of Installation are Prime Requisites for a Satisfactory Shaft Seal.

By W. MEYER

THE problem of sealing around a rotating shaft has always been a difficult one and a source of worry and grief to the designing engineer, as well as to the service man who, after all, is the one who must get out in the field and do the actual work when a seal stops functioning properly.

With the coming of the mechanical household refrigerator it was necessary to change from the old-fashioned stuffing box, which necessitates regular inspection and adjustment, to a device which is automatic in its operation, quiet, trouble-free and dependable.

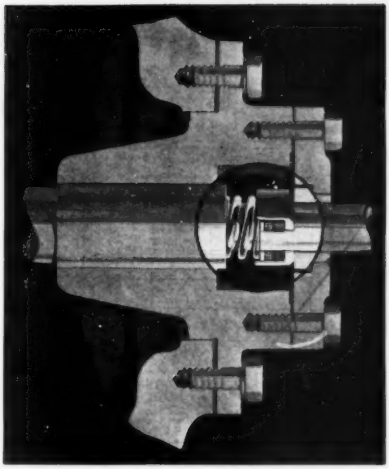
Much progress has been made in perfecting shaft seals for small refrigeration compressors, but it is generally admitted that the seal is still the weak point in the conventional refrigeration compressor and that much is still to be hoped for in this regard. The general design of all seals at present is based on a metal to metal joint between one stationary face and one rotating face. Due to the slight axial and transverse shaft movements, as well as slight errors of alignment present in all compressors to some extent, some degree of flexibility in one of the seal faces is necessary. Various methods are employed to bring about this desired flexibility; the most common one being the use of a thin metal connection, either in the shape of a bellows or a diaphragm. While

these methods are fairly satisfactory, one difficulty prevails; namely, that strength and ruggedness are sacrificed by using a metal which is thin enough and flexible enough to bring about the desired condition. This thin metal enclosure when subjected to torsional strains and continual vibration in time crystallizes and cracks, thus causing a leakage and necessitating a replacement.

This inherent weakness, as well as others concerning the service of this type of seal, has been eliminated to a great extent by another type, which today is being preferred by many service men in particular because of its simplicity, ruggedness, dependability, ease of installation and ease of servicing. This seal, which is also of the radial type, incorporates all the advantages of other mechanical seals and at the same time affords flexibility in a remarkable degree without imposing in its movements stresses liable to cause fatigue deterioration of any parts.

The rotating member of this seal embodying one of the two seal faces is a cup shaped piece which is slipped on the shaft and connected to the shaft by a ring of composition material, very flexible and resilient. The composition ring fits the shaft tightly enough to prevent any leakage along the shaft and also provides a connection between the shaft and the cup shaped seal ring flexible enough to compensate for any vibration or other shaft movement within reason. Due to the composition of this material the continual vibrations have no appreciable effect on it, nor does the oil combined with the various refrigerants attack it. A spring under compression is placed between the seal ring and a shoulder on the shaft which is capable of sliding the seal ring together with its packing ring laterally along the shaft, taking up any end motion of the shaft as well as slight wear which occurs at the seal faces. These few simple rugged parts complete the seal assembly which, due to the friction of the composition ring at the shaft and in the cup, rotates with the shaft. The mating seal face is securely placed in the gland cap which, in turn, is bolted to the compressor housing.

The materials used for the seal faces depend on the substance being handled and the operating conditions. Most generally a combination such as a hardened steel seal ring running against a self-lubricating



THE ROTARY SHAFT SEAL

bronze is satisfactory. The spring pressure necessary to effect a tight joint is also dependent on the operating conditions. In all cases a comparatively light spring, strong enough only to counteract any possible pressure against the seal face, is used. This, as can readily be seen, reduces the friction at the metal to metal joint which, in turn, keeps the wear down to a minimum.

While a seal of this type is applicable only to compressors designed particularly for it, the manufacturers of this seal have realized the great need of a replacement unit which the service man can readily apply when the original seal fails, without any of the tedious work of relapping a shaft seal face, and so have put on the market a number of change-over units consisting of a seal assembly and new gland plate which can easily be used on certain of the popular makes of compressors.

Industry is making use of the unique characteristics of this Rotary Seal in a wide variety of practical applications. It is a mechanical device, correct in engineering principles and perfect in performance, to replace packing for all rotating shafts. Today it is in world-wide use for maintaining a leak-proof pressure or vacuum on a wide range of gases and fluids.

The rotary shaft seal is manufactured by the Rotary Seal Co., 809 W. Madison St., Chicago.

REFRIGERATION SERVICE CALL CARD

Name of User .....
Address .....
Make and size machine .....
Location .....
Refrigerant .....
Date of call .....
Time arrived ..... A.M. P.M. Left ..... A.M. P.M.

MATERIAL SUPPLIED:

Quantity	Items	

Material .....
Service Call .....
TOTAL .....

MATERIAL ORDERED (to be supplied later):

Quantity	Items	

Refrigeration Complaint:

.....
.....
.....

The above complaint has been adjusted satisfactorily.
Name .....
Address .....
Service Man .....
Address .....

a ☐ ORDER DEPT.: Please enter material sold and service call as shown on reverse side hereof,

b ☐ ..... (Service Dept.)

RECEIVED FROM ..... (Service Dept.)

$ ....., on ..... (Date)

c ☐ Treasurer's Dept. by .....

SERVICE MAN'S REPORT

PRESSURES Suction .....
Discharge .....
CON. WAT. TEMP. Inlet .....
Outlet .....
COMPRESSOR R.P.M. ..... H.P. Motor .....
ROOM TEMPS. .....
ICE CUBE COMPARTMENT .....
CABINET TEMP. .....
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REMARKS .....
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Signed .....

"AN OUNCE OF PREVENTION
IS WORTH A POUND OF CURE."

5A-15-32

Copyright Servicemen Supply Co., N. Y.

CUSTOMER'S RECEIPT

$ ..... Date .....
Name of Customer .....
Address .....
Amount .....
Payment Received,
..... (Company)
Signed ..... (Service Man)

SERVICE CALL RECORD, ORDER AND REPORT FORM

CAN YOU ANSWER THEM?

THE April issue of *Simplified Refrigeration*, the house organ of the Servel Co., prints ten questions that were taken at random from one of the first quizzes given students attending the Servel Factory Schools, as follows:

1. What is the standard unit of refrigeration?
2. What is the meaning of B.t.u.?
3. What is the difference between heat and temperature?
4. What are the five principles of refrigeration?
5. What is the freezing point of a substance?
6. What is the definition of a refrigerant?
7. What is meant by the latent heat of fusion?
8. What is the difference between pressure and vacuum?
9. What is the name, the chemical formula and the boiling point of the refrigerant used by Servel?
10. What are the elements of a simple refrigeration system?

The above questions are not very hard ones and should easily be answered by anyone with a fair knowledge of refrigeration, but service men will find it interesting to see how completely they can answer these ten questions. If one is a little rusty on such information, it will be well to consult refrigeration data now available.

Application of Thermostatic Valve in Commercial Refrigeration

Description of the Operation and Function of the Thermostatic Expansion Valve as Applied in Small Commercial Refrigerating Installations. Installation Suggestions. Multiple Installations. Adjustment of Valves.

THE primary purpose of a thermostatic expansion valve is to extend the application of the dry evaporator to multiple systems, and also increase the efficiency of single evaporator or unit systems. An important point for the service engineer to remember is that the thermostatic expansion valve does not directly control the temperature or operating pressure of the system—the thermostat or pressurestat does that by starting or stopping compressor. The function of the thermostatic expansion valve is to keep the coil completely refrigerated.

In Fig. 1 we see the construction of the Detroit thermostatic valve and its component parts.

Operation of the valve is comparatively simple, and when a thorough knowledge is acquired of its operation, many useful hookups can be devised to meet an almost unlimited range of operations. Again referring to Fig. 1, a brief description of its operation may be stated as follows: The bellows H responds to refrigerant pressure, tending to close the valve on increasing pressure, exactly as in the automatic valve. The thermostatic bellows D responds to the pressure of the thermostatic liquid in the bulb K and by acting on the push rod T tends to open the valve on an increase in temperature at the bulb K. The two bellows thus operate against each other through the rigid push rod, with the result that the valve operates on the difference between the refrigerant pressure and the pressure of the thermostatic liquid in the bulb.

Adjustment of the Valve

Valves are adjusted at the factory so that the coil is kept full of refrigerant without

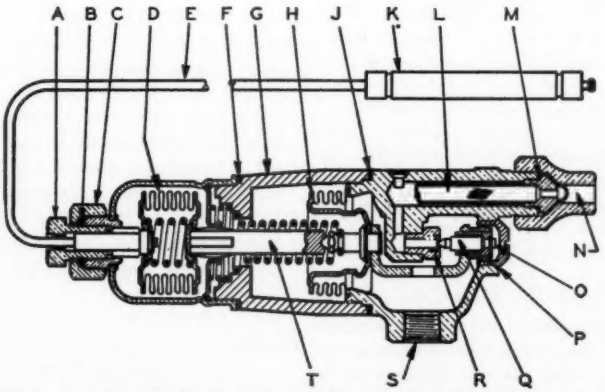


FIG. 1. CROSS SECTION OF THERMOSTATIC EXPANSION VALVE

A—Adjusting Screw. B—Moisture-tight packing around adjusting screw. C—Packing Nut. D—Thermostatic Power Element. E—Flexible Capillary Tube. F—Moisture-tight Joint. G—Bakelite Extension. H—Bellows Seal. J—Moisture-tight Joint. K—Thermostatic Bulb. L—Strainer Screen. M—Copper Gasket. N—Inlet Connection for ¼ inch copper tube. O—Needle Swivel. P—Solder-sealed Plug. Q—Stainless Steel Needle. R—Stainless Steel Seat. S—Outlet Connection. T—Bakelite Push-rod.

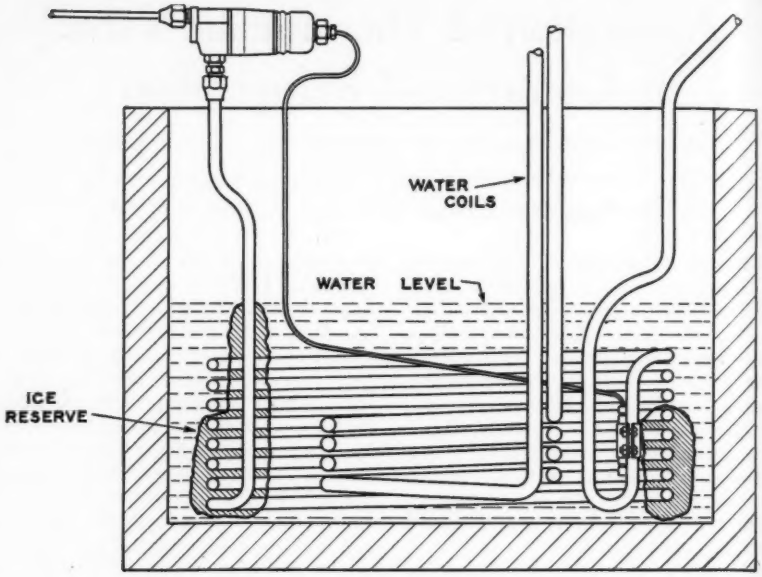


FIG. 2. ICE RESERVE CAPACITY

By freezing ice around the expansion coils, a reserve capacity is built up to meet the peak demand for beverage or beer cooling.

any "frost back." No attempt should be made to readjust the valve until the system has an opportunity to become balanced. Generally this will require several cycles. When readjustment is necessary, a good procedure to follow is to turn the adjusting nut A (Fig. 1) in until a slight "frost back" occurs, then back the adjustment out one-quarter turn at a time until proper operation results. Make these adjustments slowly so the system has time to respond. The adjusting nut A is sealed against moisture. Ample adjustment permits a wide range of temperature on multiple temperature applications.

Installation Suggestions

The thermostatic bulb must be securely clamped to the suction line, as near as possible to the point where it connects to the cooling coil, or to the end of the coil line proper. Special clamp for this purpose is shipped with each valve. This clamp can be used with any sized tubing up to ¾ in. Select a location in which the bulb will be kept reasonably cool during the shut-down period, or "off cycle." If the bulb warms up too fast, the thermostatic element will open the valve during the off-cycle and cause a temporary frost-back at the start of the operating cycle, and sometimes cause short-cycling.

Fin-type coils for air cooling have little hold-over and therefore the bulb location is not so important. However, be sure to keep the bulb away from air currents. Proper operation of the thermostatic valve requires that the thermostatic power element D (Fig. 1) always be warmer than the bulb. When the power element becomes colder than the bulb, the valve will close and refrigeration stops.

With fin-type evaporators, it is sufficient to clamp the bulb on the suction line near the evaporator, as shown in Fig. 3. It should be noted that the section line is looped back under the coil in order to prevent heat from the outside from flowing back along the suc-

tion line and warming up the bulb during the off cycle.

Bakelite extension is used to insulate the power element from the cold valve body. Locate the valve in the warmest available space. If the valve body collects too much frost, it can be covered with insulation material, but never cover the power element. In display cases, the thermostatic valve can usually be located in the warm air at the top of the case; for soda fountains, the valve can be placed inside of the syrup rack or other space where it will be protected from extremely low temperature.

Multiple Operation

As many cooling units as required can be connected in multiple when using the Detroit thermostatic expansion valves. Where all cooling units are to operate at the same temperature, the valves need no adjustment. The factory adjustment is such that the valves operate at maximum efficiency, keeping the coils completely refrigerated. Therefore, do not adjust the valves when starting up a new installation. Allow time for the system to settle down. If properly installed, the valves will work perfectly without change.

Should a valve persist in frost-back of the suction line, it should be adjusted by unscrewing the adjusting nut A one-quarter turn, then allow time to settle down before further adjustment. A pressurestat should be used to control the compressor. The adjusting nut A (Fig. 1) provides a means for operating evaporators at various temperatures in a multiple system. The valve can be adjusted to as much as 45° F. difference between the refrigerant temperature and bulb temperature, and ice cream can be made at 0° F. and can be operated in multiple with a water bath at 34° F. or warmer and other coils at various temperatures.

The valves on the coldest units should be installed without changing the adjustment from the factory setting. Valves on warmer units can be adjusted by unscrewing nut A. The pressurestat to start and stop the compressor should be in accordance with the temperature required at the coldest unit.

S S S

A. L. Kirby,
Texas.

"I have received your THE REFRIGERATION SERVICE ENGINEER, and I am greatly pleased with same. It is just the kind of a magazine I have been trying for five years to find. I wish you would send me the first two issues so that I will have my volumes complete. Wish you success with this new magazine."

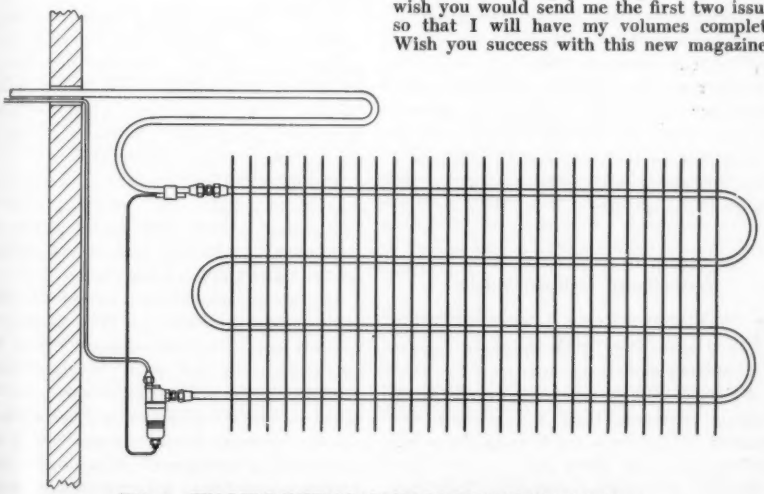


FIG. 3. FIN TYPE INSTALLATION OF EXPANSION VALVE

It should be noted that the suction line is looped back under the coil, in order to prevent heat from outside from flowing back along the suction line and warming up the bulb during the off cycle.

SERVICE POINTERS

Readers are invited to send descriptions of "kinks" which they have found to be of practical help in their every day work. Just send your idea or sketch in the rough, which will be prepared for publication. All contributors' names will be printed. Address the "Kinks" Editor, REFRIGERATION SERVICE ENGINEER, 433 N. Waller Ave., Chicago.

Dehydrating SO_2 Compressors

A GREAT amount of information is available regarding different methods of dehydrating or drying out sulphur dioxide systems; e.g. baking, circulating of the liquid sulphur dioxide through dehydrated calcium chloride or zinc oxide; washing out with carbon tetra chloride, etc.

However, a system that has "stuck up" or is showing signs of "sticking up" or shows signs of containing moisture by freezing up expansion valves, may be dehydrated very quickly by another method.

Common sense should tell us that all we have to do is to blow out the complete charge through the receiver valve into lye water or through a hose. Then drain out the old oil. Sulphur dioxide itself absorbs a lot of moisture. It is cheap and a service man can afford to throw out even 6 pounds which is lower in cost than the time and trouble of inserting a liquid drier. Furthermore, grit and dirt is blown out at the same time which will improve conditions.

Therefore at the slightest sign of corrosion throw out the old gas and old oil and refill with fresh gas and oil.

Is it fair to the customer to overhaul a stuck up compressor and leave in the old charge of gas and oil?

Isobutane Inflammable

A WORD of warning to those not having had experience with isobutane. It is very inflammable.

We know of a service engineer who while purging isobutane from a condenser was severely burned by a spark from the motor setting fire to the above gas.

Beware of smoking cigarettes and stop all cooking in the kitchen when handling this gas.

Leaky Door Gaskets

TO test the tightness of a refrigerator door gasket, sprinkle a small amount of 28% ammonia water on inside walls of cabinet and let a small quantity of sulphur dioxide out of a loosened joint or by opening a drum. The refrigerator will immediately be filled with a heavy white smoke. Close door tightly and observe if white fumes leak out of door gasket.

Commercial Forced Draft Evaporators

GRAVITY air circulation over commercial coil surfaces throughout the refrigerator space is being replaced by an evaporator unit consisting of compact copper fin coil sections enclosed in a sheet metal casing.

Positive circulation by a motor driven fan provides more efficient use of evaporator surface and assures improved distribution of cooling effect. They are known under various trade names as: Cold Diffusers (Carrier), Turbofins (Kramer), Fedders Forced Draft Unit Coolers, etc.

The units are small and light weight and quickly installed. The operating cost of fan motor (about 1/15 horse power) is negligible. The extra cost of coil bunker is eliminated and head room is saved.

It is important to select equipment which gives a high humidity of 80% to 90% to prevent drying up the product. First the correct size of fan must be determined. Second, the proper back pressure must be selected. A fair allowance is a fan capacity not over 2 cubic feet of air per minute per cubic foot of refrigerator space in small refrigerators of 100 to 400 cubic feet capacity. Allow one cubic foot of air per minute per cubic foot of space in (500 cubic feet to

1000 cubic feet) refrigerators. Allow a capacity about 8 to 10 B.t.u. per hour per cubic foot of 3 inch cork insulated space.

The service engineer who is accustomed to cooling a refrigerator with standard fin coils to 35° F. with 6" back pressure on sulphur dioxide or 8 lbs. back pressure on methyl chloride will find out that with these fan unit coolers, that much higher back pressures are recommended by the manufacturers, that is 2½ lbs. with sulphur dioxide and 15 lbs. with methyl chloride.

The regulation of humidity is a serious problem and before selecting a unit, complete specifications and recommendation should be obtained from the manufacturer in each individual case.

The service man should remember that lower back pressures dry the product while higher back pressures maintain a moist air condition.

Hookup for Pumping Down Liquid Line

I HAVE found it profitable to install on small commercial refrigerating installations that I service under contract a hookup that will permit me to quickly pump down the liquid line. The necessary changes are slight, and the expense for the material and labor very low, as it only requires the installing of a reduction tee in the suction line, and a two-way valve in the liquid line, connected together by tubing.

The accompanying sketch clearly indicates the arrangement for the installation of the hookup.

In many cases in the plants that I am called on to service, I have made the installation at the customer's expense, as I have explained that by installing this arrangement, the cost to the customer for servicing, such as cleaning screens, or changing filters, would be greatly reduced in the future, as the time required to perform the operation was considerably reduced by its use.

If it is found necessary to pump down the lines for any reason, such as to clean the screens, change the filter, or to pump down excessive oil in the float chamber, the procedure is as follows: Close the King valve

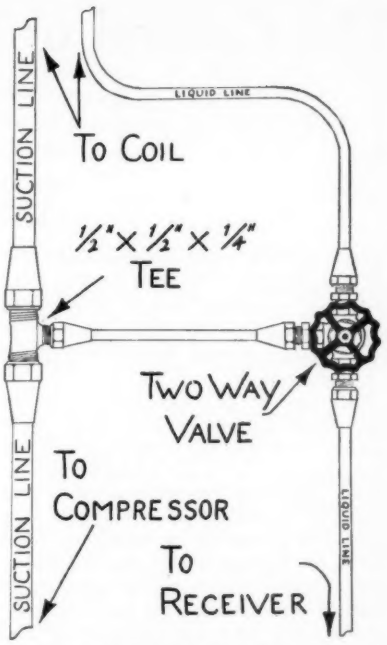


DIAGRAM OF HOOKUP FOR PUMPING DOWN LIQUID LINE

at the receiver, open the two-way valve and then pump down until the lines have been evacuated, which then permits the removal of the liquid line for whatever operation is necessary, and this is done without the loss of any of the refrigerant.

This hookup has proved so satisfactory that I always figure on installing same on any new plants that I install. I have also found that they prove very satisfactory even in the small domestic refrigerator.—*R. B. Vanston.*

A. M. Smith,
Arizona.

"Your magazine is going to fill a need which has been growing rapidly for the last two years. Oil burners would be a good winter side line."

E. F. Showman,
Maryland.

"Enclosed find money order for $2.00 for subscription to THE REFRIGERATION SERVICE ENGINEER, which I find is very instructive. Keep up the good work."

The Control of Refrigerants . . .

[ARTICLE NO. 3
CONSTANT PRESSURE TYPE EXPANSION VALVE]

The Constant Pressure Expansion Valve Is Inexpensive and Simple. Its use is Limited to Where Coils are in Series. This article describes its use and Construction.

By J. L. SHRODE*

THE simplest automatic expansion valve is the constant pressure type. This valve maintains a constant suction pressure, to within a few pounds, by varying the amount of refrigerant flowing through it into the low side coils.

The constant pressure type expansion valve is the cheapest and the simplest expansion valve and for these reasons it has a definite use on small refrigerating systems. This valve is an improvement over the hand expansion valve in that, in most cases, it will shut off the refrigerant when the machine is shut down. Another advantage is that it eliminates the necessity of constant attendance by the user of the refrigerating plant. By automatically controlling the expansion, this valve saves much time for the operator of a small plant who generally has many other duties in addition to the operation of the refrigerating system. The constant pressure expansion valve also permits the use of dry type expansion coils instead of the more expensive flooded coils.

Use of Constant Pressure Valve

The use of the constant pressure type expansion valve is limited to systems where coils are in series. Generally, it is not used in connection with other equipment such as hand expansion valves, low pressure floats, etc. This valve is not the most efficient means of control as its sole purpose is to maintain a constant pressure in the low side regardless of varying conditions on both high and low sides. It, therefore, will not compensate for the varying load conditions which are present in all refrigerating systems. Although the efficiency of the constant pressure type expansion valve is not great, it has a logical application on small refrigerating systems, because on such systems the efficiency of the plant is of considerably less importance than that of large refrigerating plants. On such small systems the elimination of the operator's attention and the dependability of the control are of far greater importance than the efficiency of the system.

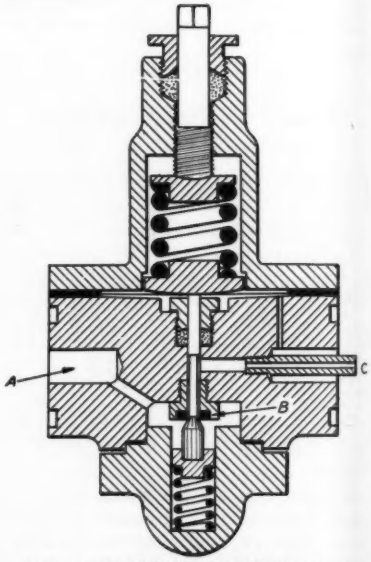


FIG. 1. CONSTANT PRESSURE TYPE EXPANSION VALVE

The valve consists essentially of a diaphragm which regulates the opening of the valve as the pressure on it tends to vary. The suction pressure acts on this diaphragm through a small hole which transmits the suction pressure to the under side of the diaphragm. A cross-sectional view of a typical design of this valve is shown in Figure 1.

*President, Alco Valve Co., St. Louis, Mo.

The liquid refrigerant enters this valve at "A" and passes through the spring chamber "B," through the pin valve, and out through the discharge tube "C." The actual expansion takes place at the outlet of the discharge tube and not in the valve body. By thus preventing expansion in the valve body, the possibility of water freezing on the diaphragm or of oil congealing in the valve is eliminated. Due to this construction, low velocity liquid passes through the valve seat rather than high velocity gas and the cutting and scoring of the pin and seat are minimized.

The suction pressure is exerted upon the bottom side of the diaphragm through a vent. On the upper side of the diaphragm is a spring exerting a downward force on it. This downward force on the diaphragm tends to open the valve against the bottom spring pressure by forcing down the push rod which in turn moves the pin out of the seat. Any pressure on the under side of the diaphragm will tend to counteract this downward force of the top spring and, therefore, tend to close the valve. When the pressure on the under side of the diaphragm is increased, the spring pressure on the valve pin is relieved and the bottom spring pressure then forces the valve pin upward, closing the valve. The adjusting stem provides a means of varying the pressure on top of the diaphragm. This adjustment makes it possible to set the valve to maintain any desired suction pressure.

In order that the capacity of the valve is correct for each specific installation, various size discharge tubes are used in the type valve illustrated. The larger the opening in the discharge tube, the more refrigerant will pass through it and the larger the capacity of the valve. If the discharge tube is too small the valve will not pass enough refrigerant to completely cool the load. If such is the case the tendency of the operator is to open the valve wide by using the adjusting stem. The valve is then always open wide, losing its value as an automatic regulating valve, and is still not passing sufficient refrigerant. When the discharge tube is too large the refrigerant expands in the valve body rather than outside of it as it should. The valve then frosts and gives rise to the difficulties discussed previously.

OVERHAULING A SERVEL

By THOMAS J. FOWLER

THE writer recommends certain changes in a Servel system, based on his experience in the field with this equipment.

The several troublesome elements in this system can be easily eliminated, resulting in a very practical and satisfactory refrigerating plant.

The grease seal has a tendency to leak oil and gas, necessitating frequent servicing. The continual opening of any refrigerating system for the introduction of oil or gas soon leaves its mark, for each time a system is opened, a certain amount of foreign matter of some kind or other enters, which in time causes corrosion, coating valves and other moving parts, rendering their operation sluggish and unreliable.

A high side float valve employed in a system controlled by a pressure switch is a delicate combination, because a slight loss of refrigerant, or an under-charge and also an over-charge will cause erratic operation. If the system is short of refrigerant, the low pressure switch will start and stop the motor at short intervals, the unit not running long enough at a time to produce the required cooling effect in the brine tank, and in the case of an over-charge, the unit will run continually at a back pressure that is too high to produce the required temperature at the brine tank. The present day methyl chloride that is charged with a tracer agent will not work well in a Servel high side float valve, unless the high side of float chamber is by-passed to the suction side of the system, so that the non-condensables are allowed to pass out of the liquid side of the float, preventing gas binding.

The pressure switch used in this system also acts as a throttle valve, controlling the suction gas pressure between brine tank and compressor, thereby relieving the compressor of fluctuating loads. If dirt or other foreign matter is present in the system, the piston or plunger in the lower body of pressure switch will not operate freely and will cause a change in operating temperatures in the cabinet. Brine tanks that are standard equipment with this unit are

cooled by a series of three eight inch copper tube coils. The coil is soldered into an accumulator; this accumulator is in the brine tank under the suction outlet. Very often a leak develops in this part of the coil, allowing brine to enter the system.

It is generally conceded that this compressor is well designed and constructed, and has an exceptionally long life as compressors go. The writer has made the following changes on a number of these units, and each customer is well pleased. However, if the customer is not in accord with a thorough overhauling, you will be better off if you leave the job alone.

Proceed as follows: Thoroughly recondition compressor, turn and polish crank shaft, adjust or replace bearings, install new rings and valves, replace grease seal with sylphon seal, replacing all worn or broken parts, repack all valve stems. Recondition, clean and test condenser, remove float ball and valves from float, clean float chamber leaving ball and valve out, mount float chamber between condenser and liquid valve, so as to have it act as a receiver. Have motor thoroughly gone over by a reliable motor repair company. Test and repair brine tank, or replace with modern evaporators and automatic expansion valve.

If you elect to repair the old brine tank, mount a reliable automatic expansion valve on top of brine tank in a manner that adjustments can be made. Next mount a cold control in coil compartment, setting bulb of cold control about one-third down from top in brine tank, and seal the brine filler hole over with hot hydroline; replace old tubing with new.

If this work is done properly, it makes an excellent unit, and can be easily guaranteed for a reasonable length of time. We have been charging from $45.00 to $100.00 for these jobs, depending on the amount and quality of the changes the customer wants.

* * *

C. L. Ditto,
Florida.

"Enclosed you will find my money order for subscription to THE REFRIGERATION SERVICE ENGINEER. It is the paper we service men have been waiting for. Here's for success in this, 'our magazine.'"

??????????????????
THE Question BOX
??????????????????

Readers are invited to send their problems pertaining to the servicing of household refrigerators and small commercial refrigerating equipment as well as oil burners to "The Question Box" which will be answered by competent authorities.

Question 10. I notice the article in the July issue on the Holmes Household Refrigerator. Please advise me the amount of oil this machine holds and the kind to use.

ANSWER. The Holmes Mechanical Refrigerator holds one quart of oil. You will find that a quality of oil such as Ursa, or similar, as manufactured by other companies, will be found satisfactory. Write The Matheson Co., East Rutherford, N. J., for their recommendation.

Question 11. In your Service Pointers, August Issue, "Chemicals for Driers," you refer to C. P. flake zinc oxide for drying or dehydrating sulphur dioxide liquid. None of the drug supply houses in my town handle it in flake form. Please advise me where I can purchase this material.

ANSWER. The reason for specifying flake zinc oxide for all dehydrating purposes was to warn a service man that if he uses a substance in its powdered form, he must have a filter in the line to trap the powdered particles which may travel along with the refrigerant. If flake is used, the large flakes will be trapped by the strainer with which every drier is equipped.

Calcium chloride has always come in flake form, as well as calcium oxide, and therefore no one had much trouble if no filter was used. Only a fine mesh strainer was required with the flake calcium chloride or flake calcium oxide. Of course, if you use the powdered zinc oxide, you will experience

trouble, and it is therefore necessary, when using zinc oxide in powdered form, to place a filter past the drier.

These filters are very inexpensive, and will prevent any further difficulty as powdered zinc oxide is easy to secure.

Question 12. As a reader of your magazine, we would like to know the wattage and time of operation of heater coils used in mechanical refrigerators for oil conditioning such as used on General Electric.

ANSWER. General Electric hermetically sealed domestic refrigerators have a 10 watt heater in the lubricating oil. The purpose of this heater is to prevent condensation of refrigerant in the oil, thereby assuring quieter operation of the machine. The heater is on continuously.

THE following questions have been presented at recent meetings of Chicago Chapter of the Refrigeration Service Engineers' Society, through its "Question Box," and answered by C. E. Hamilton, chairman of the Educational Committee.

Any reader who can supplement the information published is invited to send it to the Editor for publication.

Question 13. What are the possible sources of a carbolic acid smell and taste in ice cubes?

ANSWER. This odor is usually found in boxes in which the wood used in the construction of the framework has been dipped in creosote—O. K. for telegraph poles but not mechanical refrigerators.

Question 14. What are the causes of a gummy deposit on the walls of methyl chloride compressors?

ANSWER. Often caused by the compressor oil striking the hot surfaces.

Question 15. Method of converting a Copeland from Isobutane over to sulphur dioxide.

ANSWER. It is usually not advisable to use a different refrigerant in a machine than the one it is designed for. However, should the change be made, the machine must be thoroughly cleaned and dried. The oil in the machine should be removed and replaced with new oil. Isobutane is not manufactured as dry as sulphur dioxide and contains enough moisture to cause trouble if not entirely removed.

Question 16. Method of changing Frigidaire over from dichlordifluoromethane to methyl chloride.

ANSWER. As stated above, the machine should be completely discharged, cleaned and dried and charged with new oil. In some cases, it may be necessary to change the refrigerant flow control as F-12 machines operate at higher back pressures than methyl chloride.

Question 17. Difference between F-12, F-14, dichlordifluoromethane and Freon.

ANSWER. F-12, dichlorodifluoromethane and Freon are one and the same refrigerant. The chemical name is dichlorodifluoromethane (CCl_2F_2); Freon is the trade name. F-12 originates from the fact that dichlorodifluoromethane is a halogen derivative of methane and therefore belongs to the methane series. This series is referred to by chemists as the 10th Series, therefore $F_2 + 10 = F\text{-}12$. F-14 and dichlorotetrafloroethane ($C_2Cl_2F_2$) are the same.

Another example of this case of calling a refrigerant by several names is found with carrene (CH_2Cl_2). Carrene, the trade name, is also called dichloromethane and methylene chloride.

Question 18. What is a sure way of determining a shortage of refrigerant?

ANSWER. The following are symptoms indicating a shortage of refrigerant:

No or poor refrigeration.
Hissing sound at the float valve.
Low suction pressure.
Warm liquid line.

A liquid indicator is available on the market for detecting a shortage of refrigerant. This indicator is installed in the liquid line and contains a glass "bull's eye." The liquid line should be full of refrigerant at all times so that a shortage of refrigerant will be indicated by vapor bubbles under the glass of the indicator. If the system is very short of refrigerant, the "bull's eye" will be foggy.

Refrigerator Oils

The Selection of Proper Oils for Mechanical Refrigerators is one of much Importance. The Service Man should be familiar with the Characteristics of Lubricants especially in Conjunction with their use with Various Refrigerants.

By A. M. MATHESON*

THE average user of refrigerator oils has not the specialized viewpoint of the oil expert, and must be guided in his search for quality by such broad considerations as specifications, reputation of a branded product, and all around performance

The producer of refrigerator oils must, therefore, closely relate performance and specification. The value of performance is based on the various kinds of work required by the different types of compressors, and the different gases used and the proper application of oils of suitable characteristics. Specifications are a convenience for identifying oils, and to some extent indicate their general value.

From the point of view of oil, there are two types of compressors, called the "open" and the "closed." The general classification of the refrigerants used in commercial and domestic refrigeration may also be divided into two classes. Under the hydrocarbon gases are Methyl and Ethyl Chloride, Isobutane, Freon, Carrene, etc., and under the inorganic gases are Sulphur Dioxide, Ammonia and Carbon Dioxide.

We may now identify the special requirements through a general description of the principal specifications.

The hydrocarbon gases particularly demand a lubricant which will not dissolve or be dissolved by the gases, and which will exercise a minimum chemical reaction between them. This property is promoted by extra acid and clay treatments whereby the constituents producing mutual solubility are largely removed. Specifically—this is not only indicated by the color but also in the sludge and cold tests and in the special test for solubility in liquid sulphur dioxide, and carbon residue.

The inorganic gases, particularly CO_2 and NH_3, where high compression and high heat of compression are developed, require oils able to function not only at low temperatures but at comparatively high heats. This quality is checked in specifications by what is termed "viscosity range or index": in other words, the oil does not lose its "body" rapidly with increasing temperature.

Tests for Oils

Beyond these two principal and distinguishing characteristics of oils suitable with refrigerating gases, are general tests such as "viscosity," "flash," "cold" and "gravity" tests. A suitable range of these tests is as follows:

Viscosity: 100 to 300 seconds at 100° F.
Flash: 300° to 400° F.
Cold: Zero to —40° F.
A. P. I.: 27° to 20° Be.

Viscosity measures the body of the oil. A slightly more exact definition embodies the resistance to flow of a unit amount in unit time through a unit distance at an established temperature. These conditions are arbitrarily approximated in the United States by what is known as the Saybolt Viscosity Test, and is measured in a Saybolt Universal Viscometer instrument, which is the number of seconds in which 60 cubic centimeters of oil take to flow through a standardized orifice, at a certain temperature; usually 100° F. or 210° F. An oil suitable for a wide variety of refrigerating machines should require about the specification for viscosity given above.

The "Flash" is determined by the temperature required to ignite the oil vapor when a flame about ¼" long is passed across the top surface of the oil. The technique, of course, is definitely prescribed. A low flash, for example near normal temperature,

* President, The Matheson Co., Inc., East Rutherford, N. J.

would be dangerous in an oil used as a lubricant. A mixture of a low flash and high flash oil to meet a certain viscosity and cold test, is usually detected by the flash test.

The method for the cold test, like the other tests, is controlled by strict rules of procedure. Its object is to show the temperature at which the oil congeals under operating conditions.

The A. P. I. Baumé (American Petroleum Institute) is a gravity scale, devised in early days based on the relation of volume and weight to a 10% salt solution. Like the commercial viscosity tests this does not lend itself readily to conversions or calculations, but ancient habit has crystallized it into the specifications for lubricants.

There are certain other tests such as acidity, color and even odor, which are of varying importance.

In view of the indefiniteness of specifications, the average user will find the old tedious method of trial and error to yield the surest results; but if the foregoing outline may be used as a sufficient guide, the following specification for the hydrocarbon gases might be regarded as defining about the right quality of refrigerator oil:

Viscosity: 150 seconds @ 100° F.
Flash: 350° F.
Cold Test: —30° F.
A. P. I.: 27° Be.
Color: Water White.

For the Inorganic Gases a specification close to the following, has been used for many years by the industrial manufacturers of ice, and found very satisfactory:

Viscosity: 100 seconds @ 100° F.
Flash: 325° F.
Cold Test: —20° F.
Color: Topaz.

S S S

F. A. Bailey, Jr.,
South Carolina.

"Sample copy of THE REFRIGERATION SERVICE ENGINEER received and enjoyed immensely. I think your book will give a lot of valuable information for all service men. I enclose check for $3.00—$2.00 to cover this subscription and $1.00 for your binder. Kindly see that I get the July and August issues, as I want this set of magazines to be complete, and would not care to start same missing the above issues."

REFRIGERATION SERVICE DATA

EVERY service man should keep a scrap book as he proceeds in the study and practice of refrigeration service engineering. In this scrap book should be pasted interesting clippings from technical journals, tests and data referring to various installations with which the service man has had experience.

From time to time necessary data from the scrap book should be transferred to the service engineers hand book loose leaf folder, which may be obtained from the Refrigeration Service Engineers Society for the sum of $1.00.

The past issues of the REFRIGERATION SERVICE ENGINEER contain the Trouble Chart and Complaint Charts 1 to 4, inclusive. Future issues will contain the following complaints:

Long on Cycle But Refrigerator Temperature Satisfactory.
Ice Cubes Freeze Too Slow or Not at All.
Refuses to Start After Being Shut Down Some Time.
Machine Runs a Few Minutes and Shuts Down a Few.
Radio Troubles.
Bad Smell in Cabinet and Bad Tasting Food.
Sweating on Inside of Refrigerator.

Complaints are listed applying to all systems as follows: Low pressure float with both thermostat control and pressurestat control; high pressure float with both thermostat control and pressurestat control; capillary tube with thermostat control; automatic direct expansion with thermostat control; thermostatic direct expansion with pressurestatic control. It is believed these charts will be most helpful.

S S S

R. F. Weidlein,
Tennessee.

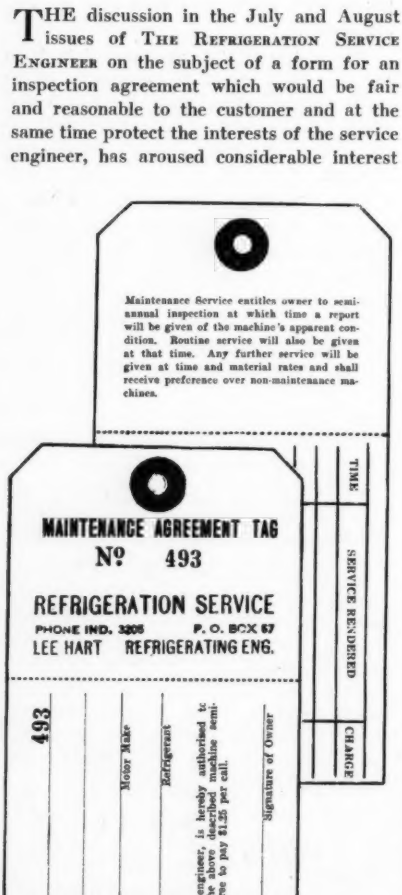
"Enclosed you will find $2.00 for subscription to THE REFRIGERATION SERVICE ENGINEER. I like the magazine very much, and if possible I would like to get the June and July issues. Again expressing my appreciation of the service rendered by your new magazine, and wishing you a lot of success in its publication."

Service Inspection Agreement

Additional Suggestions are Presented in this Article for Service Agreement Forms. A Simple Service Inspection Agreement protects both User and Service Man. Use of Maintenance Agreement Tag Described.

THE discussion in the July and August issues of THE REFRIGERATION SERVICE ENGINEER on the subject of a form for an inspection agreement which would be fair and reasonable to the customer and at the same time protect the interests of the service engineer, has aroused considerable interest and additional suggestions have been received.

A communication received from Mr. Lee Hart, who is conducting a refrigeration service at Independence, Mo., is presented herewith, together with the reproduction of the Agreement Tag referred to.


Maintenance Service entitles owner to semi-annual inspection at which time a report will be given of the machine's apparent condition. Routine service will also be given at that time. Any further service will be given at time and material rates and shall receive preference over non-maintenance machines.
MAINTENANCE AGREEMENT TAG
Nº 493
REFRIGERATION SERVICE
PHONE IND. 3305 P. O. BOX 67
LEE HART REFRIGERATING ENG.
TIME
SERVICE RENDERED
CHARGE
493
Owner
Address
Make Machine
Motor Make
Belt Size
Refrigerant
Lee Hart, refrigerating engineer, is hereby authorized to inspect, oil and adjust the above described machine semi-annually, for which I agree to pay $1.25 per call.
Signature of Owner

To the Editor: Regarding the article on Service Inspection Agreement which appears in your July issue, I am inclosing a Maintenance Agreement tag which I have been using for two years. One part is tied to the machine and the other goes into my file. Because my reasons for using this tag were different from those given by Mr. Herkimer, I will give them. First, service will become so seasonable as to get completely out of control if allowed to do so. These tags enable one to make calls during slack periods and to make all needed repairs which I consider advisable so that when a rush is on it will not bob up at the end of a 23 hr. day to break one down.

These tags are only issued to users that I am willing to carry to the first of the following month and are good pay.

The charges are half those suggested in your article, but this service can be given profitably at any price, not only in slack periods but also when in the vicinity of the job.

All that Mr. Herkimer says about the value to the user is very true. I only wish to add the benefit to the serviceman. A quite definite knowledge of what supplies will be needed far in advance, an equally definite knowledge of the condition of the machines belonging to my best customers, closer contact with the users themselves, ability to fill in slack time, opportunity to sell additional equipment where needed—not as a salesman but as a purchasing agent, and greatest of all, a valid reason for putting off or refusing to service those few whom we all come up against who put me to more expense to collect from than it's worth.

Yours very truly,

LEE HART.

Mr. Max Rothenberg, of Detroit, Mich., contributes a form of agreement which he

has used with success and is known as the Republic Standard Maintenance Contract, and reads as follows:

REPUBLIC STANDARD MAINTENANCE CONTRACT

THIS CONTRACT, made in duplicate, this .....day of....., 193.., by and between....., Name of Service Company hereinafter called the Seller, and..... ....., hereinafter called Name of Purchaser the Purchaser.

WITNESSETH:

In consideration of the price hereinafter specified to be made by the Seller to the Purchaser, for the service to be by him performed, the Seller agrees to render the service hereinafter described, on all units now installed in apartments under management of....., for a Name of Purchaser period of twelve (12) months, on all buildings listed in schedule attached hereto.

The Seller Agrees:

1.—To make a thorough inspection every 30 days, approximately, and for the purpose of such inspection, authorized Seller Representatives will be granted free access to the location of all units and equipment at any time during business hours.

2.—To make all necessary mechanical adjustments and repairs which may become necessary before the next monthly inspection, in order to assure proper operation of the equipment.

The Purchaser Agrees:

3.—To pay to the Seller the sum of..... .....per individual apartment on the 10th of every month, following inspection.

4.—To report immediately any condition which may indicate the need of correction before the next regular inspection.

5.—To make, or cause to be made, promptly, any repairs necessitated by accident, abuse or neglect, to pay as an extra for any parts that are necessary in making such repairs.

It Is Further Agreed That:

6.—The Purchaser shall accept the judgment of the Seller as to the means and methods to be employed for any corrective work under consideration.

7.—The Seller is not obligated to assume the charges or to make a refund to the Purchaser for any service work performed by others.

8.—This contract is subject to cancellation by either Purchaser or Seller at any time on 30 days' written notice, and Purchaser agrees to pay all service up to time of cancellation.

9.—This contract is non transferable.

10.—In event of cancellation, the Purchaser shall immediately surrender his copy of this contract.

.....SELLER .....PURCHASER

By..... By.....

Address... Address...

It has been suggested that in view of the discussion in reference to the definition or the meaning of the words "Servicing," "Installation" and "Maintenance," that it would be good policy to eliminate the word "Maintenance" in each of the two forms suggested above and that the words "Service Agreement" or "Service Contract" be used instead.

The subject is to be submitted to the various chapters of The Refrigeration Service Engineers' Society, with the thought that some standard form might eventually be adopted. Further discussion of the matter is invited.

PORTABLE DRY-TEST GAS METER

ELECTROLUX Bulletin 18 announces the availability of a simplified 3-light gas meter with large observation dial on index registering 1/10 cubic foot per revolution, to be used in connection with the Electrolux burner adjustments.

The application of this special meter should be of great value to the field in adjusting burners, as well as checking gas flow when inspection is made.

The accuracy of this meter is said to be comparable to that of the wet test meter for direct reading. Due to its portability, it is especially adaptable for field work.

Construction consists of tinned steel-case meter, equipped with handle for ease in carrying, and special connections for ⅜" i.d. hose. Height, 18¾"; width, 9¾"; depth, front to back, 7¾"; weight, 11 pounds.

The net price of this meter, f.o.b. Evansville, will be $15.00, including Federal Excise tax. Directions for using will accompany each meter.

The REFRIGERATION SERVICE ENGINEER

A Monthly Illustrated Journal, Devoted to the Interests of the Engineer Servicing Refrigeration Units, Oil Burners and other Household Equipment.

VOL. 1 October, 1933 No. 5

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Official Organ
REFRIGERATION SERVICE ENGINEERS' SOCIETY

THE NRA CODE

THE publishers of THE REFRIGERATION SERVICE ENGINEER have received numerous inquiries from its readers relative to the adoption of an NRA Code, governing the business of refrigeration servicing of domestic refrigerators and small commercial refrigerating units.

This matter is receiving the consideration of the officers of the Refrigeration Service Engineers' Society, who are in contact with the proper authorities and other large industries closely allied to the refrigeration profession, and who have adopted and submitted codes.

The Refrigeration Service Engineers' Society is securing and gathering all information possible to submit a code when deemed advisable, and which will conform to the requirements of the National Industrial Recovery Act. Several chapters of the National Society have appointed committees and are preparing the code for submission to the National Society to assist them in the adoption of any code that may be formulated.

Any code adopted by the Refrigeration Service Engineers' Society will be submitted to the membership for final approval, and the publishers of THE REFRIGERATION SERVICE ENGINEER invite any suggestions from its readers in reference to this matter.

SELLING SERVICE

ONE of the most intangible commodities sold might be termed "service." The purchaser of any service is buying confidence in the person who is employed to do the job.

Service cannot be seen, yet in the final analysis it is certainly one of the most important considerations of any business transaction.

The service man, when called upon, is in much the same position as any other professional man. He is called because of the confidence in his ability to accomplish the work satisfactorily at a fair and equitable price for both consumer and seller.

After a careful inspection, the service engineer should certainly not obligate himself for any extended guarantee unless he is thoroughly satisfied that he can back up the guarantee he makes. Better to lose one job than jeopardize business through dissatisfied customers who do not hesitate to tell their grievances to other potential customers.

When the customer is sold and satisfied with the service that you render, you usually have obtained an account which can do you inestimable good in making recommendations to others requiring your service.

It is regrettable that many service men in their anxiety to secure a job will make unwarranted promises and guarantees that they well know they are not in a position to fulfill when called upon to do so. It is this type of service that will eventually react to the disadvantage of any service man or service organization. It is well in any service work, where any guarantee is to be made, that the purchaser thoroughly understand the conditions of the guarantee or agreement, and a plain statement of facts is usually the most satisfactory.

Call backs in some instances, are necessary until the equipment is adjusted correctly. However, innumerable call backs through defective service work cause annoyance to the purchaser, and eventually tend to lessen the confidence in the service organization that did the work.

COMPLAINT CHART NO. 5

C=CAPILLARY TUBE
LF=LOW SIDE FLOAT
HF=HIGH SIDE FLOAT
DA=AUTOMATIC EXPANSION VALVE
DT=THERMOSTATIC EXPANSION VALVE
T=THERMOSTAT CONTROL
P=PRESSURE CONTROL

CAUSES OF COMPLAINT	SYSTEMS						
	LF		HF		C	DA	DT
	T	P	T	P	T	T	P
COMPLAINT NO. 8—MACHINE RUNS A FEW MINUTES AND SHUTS DOWN A FEW MINUTES (SHORT CYCLING)							
(a) Loosely clamped thermostat bulb. Clamped at too cold a spot	√		√		√	√	
(b) Control differential too close	√	√	√	√	√	√	√
(c) Stuck shut float		√		√			
(d) Low on charge				√			
(e) Pressure control set too high cut-out and too low cut-in		√		√			√
COMPLAINT NO. 9—ELECTRIC BILLS TOO HIGH							
(a) Any causes listed under Complaints Nos. 1, 2 & 4							
COMPLAINT NO. 10—BLOWS FUSE OR OVERLOAD							
(a) Insufficient oil	√	√	√	√	√	√	√
(b) Stuck compressor	√	√	√	√	√	√	√
(c) Tight bearings	√	√	√	√	√	√	√
(d) Excessive condenser pressure	√	√	√	√	√	√	√
(e) Overcharge or air in system	√	√	√	√	√	√	√
(f) Stuck shut discharge compressor valve	√	√	√	√	√	√	√
(g) Partially closed line or service valve	√	√	√	√	√	√	√
(h) Clogged discharge line	√	√	√	√	√	√	√

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(5)

Cut out along outer line and insert in binder for ready reference.

FOR LEATHER BINDER WRITE TO H. T. McDERMOTT, SECRETARY REFRIGERATION SERVICE ENGINEERS' SOCIETY, 433 N. WALLER AVE., CHICAGO, ILL.

REFRIGERATION SERVICE ENGINEERS' SOCIETY

Official Announcements of the activities of the National Society and Local Chapters appear in this department as well as articles pertaining to the educational work of the Society.

THE OBJECTS OF THE SOCIETY

To further the education and elevation of its members in the art and science of refrigeration engineering; with special reference to servicing and installation of domestic and small commercial equipment; for the reading and discussion of appropriate papers and lectures; the preparation and distribution among the membership of useful and practical information concerning the design, construction, operation and servicing of refrigerating machinery.

ASSOCIATION HEADQUARTERS: 433-435 North Waller Ave., CHICAGO, ILL.

Why the R. S. E. S.?

THE advancement of any industry, or profession, is recorded by the advancement of each individual which that industry, or profession, embraces. The history of the success of American business is a record of the cooperative effort of individuals engaged in the same lines of endeavor, cooperating with each other to reach a common objective. No one can live unto himself and expect to advance far in his chosen profession. It is only by the interchange of ideas, and the discussion of mutual problems, that progress is made.

Without exception, practically every industry and profession has its association or society representing its interests, where each member finds a common ground to participate in the discussion of mutual problems which will assist him in his quest for further knowledge.

There is no more forceful recognition as regards the efficacy of organization effort, than the President's recent request that associations assume the initiative in formulating business codes for the industries which they represent, in accordance with the National Industrial Recovery Act.

The Refrigeration Service Engineers' Society is the answer to an insistent demand from the rapidly growing field of men engaged in refrigeration servicing, to band together in a common effort to make themselves more proficient in their chosen line of endeavor, and to elevate the standards of their profession, and to encourage ethical standards of practice.

The Society represents those men actively engaged in the servicing of household refrigerators and small commercial equipment. Its activities are principally educational, and it provides at all times that its meetings and literature must give first consideration to this subject. It also provides for the dissemination of information to all members of the Society, so that whether they are affiliated with the Society through a local chapter or as a member-at-large, they will participate equally in its educational activities.

Its principles are well grounded and patterned on the same progressive lines of other prominent engineering societies.

If you are actively engaged in servicing work, or affiliated with the refrigeration servicing industry, you are invited to its membership. Application blank and further information may be secured by addressing the National Secretary's office, 433 N. Waller Ave., Chicago, Ill.

MEETINGS OF CHAPTERS

Detroit Chapter No. 1

Meeting of August 16

A REGULAR meeting of Detroit Chapter No. 1 was held Wednesday evening, August 16, at Gerow's Hall, 333 W. Grand River Ave. The meeting was called to order by President George H. Clark, and the minutes of the previous meeting were read and approved.

The educational program included a talk by Mr. Dan Wile, of the Detroit Lubricator Co., who spoke on "The Application of Thermostatic Expansion Valves."

Mr. A. P. Stevens read a communication from the National Secretary's office in reference to the recommendations of the Standards Committee of Chicago Chapter.

At this meeting, eleven new members applied for membership in the Society.

The election for first and second vice-presidents resulted in the following being elected to the respective offices: First Vice-President, Ray Peters; Second Vice-President, Paul Mercer.

A suggestion was made to secure a permanent meeting place for the Society.

Meeting of September 6

A meeting of Detroit Chapter No. 1 was held on Wednesday evening, September 6, at the permanent meeting place, the Danish Brotherhood Temple, 1775 W. Forest Ave. The meeting was called to order by President George H. Clark, and the minutes of the previous meeting were accepted as read.

President Clark then appointed a committee of three members, Messrs. J. H. Downs, Walter O. Klein and Andrew B. Plassey, to report at the next regular meeting regarding the advisability of the adoption of an NRA code.

The President also appointed an Entertainment Committee consisting of the following members: Messrs. Orbie Evans, E. C. McKerracher, and C. Abel.

President Clark then suggested that a Question Box be placed in the meeting room, and members be invited to place in it any questions that they might desire information on.

Mr. James H. Downs suggested that a facsimile of the emblem of the Refrigeration Service Engineers' Society be made for members to place as stickers on their cars.

Greater Chicago Chapter No. 1

Meeting of September 12

The meeting was called to order by President T. J. Fowler, and the minutes of the previous meeting were accepted as read.

The Membership Committee reported favorably on the applications of Messrs. Joseph Dubin, Edward Geever, A. W. Larson, Clarence Weichman, Edward Schwartz, Victor C. Wines, Ralph W. E. Maxwell and Forrest Middaugh, for membership.

The meeting was turned over to Mr. C. E. Hamilton, chairman of the Educational Committee, who in turn introduced Mr. L. E. Strasburg, assistant sales manager of the Mueller Brass Co., Port Huron, Mich., who talked on "Valves and Fittings for Refrigeration Work," as manufactured by their company.

The Standards Committee reported that further work is being done regarding their recommendations, and they expect to have an additional report to submit to the Chapter at an early meeting.

Meeting of September 26

President T. J. Fowler called the meeting of Chicago Chapter to order at 8:30 in the Sherman Hotel, and the usual business matters were disposed of.

Mr. C. E. Hamilton, chairman of the Educational Committee, advised that in the absence of a representative of the Zerozone Company, who was to have been present to give a talk on Zerozone Refrigerators, Mr. R. F. Polley had consented to discuss the various service requirements of this refrigerator. Mr. Polley delivered a most interesting talk, and answered a number of questions which the members were interested in.

Following Mr. Polley, Mr. C. A. Rickner, of the E. Vernon Hill Co., air conditioning engineers and consultants, gave a most interesting talk on the various considerations entering into the installation, servicing and

considerations of air conditioning requirements.

As part of the educational program planned at the previous meeting, Mr. Peter Stein gave a practical demonstration on job estimating, on the blackboard, in order to show the necessity for carefully estimating the various materials required, and the actual costs.

Mr. C. E. Hamilton concluded the educational program with a talk on the "Cycle of Operation of the Servel Gas Refrigerator." Mr. Hamilton stated that, in response to a number of questions which had appeared in the Question Box on the absorption type of machine, he had brought colored diagrammatic illustration, which showed very clearly the flow of gases through the system.

A motion was made and carried that the Standards Committee consider the adoption of a code in compliance with the NRA and that any recommendations which were made should be sent to National Headquarters for consideration.

Mr. Harry DeGan was unanimously elected as temporary treasurer.

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GEORGE MONJIAN, Pres.

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Northern New Jersey Chapter No. 1

Meeting of September 13

THE meeting was called to order by President Hummelt, and the minutes of the previous meeting were read and accepted.

Two new members were accepted—Mr. Thomas E. Gregg, of Roselle, and Mr. G. H. Casper, of Fort Lee.

The educational program of the evening was the discussion of a paper on the application of refrigeration in beer cooling and beverages, compiled by the Zerozone Co., and a talk on the subject by Mr. Walter W. Kempf, of the York Ice Machinery Corp.

The Educational Committee reported progress in arranging future programs, and is expected to have a definite schedule planned for future programs within the near future.

The members present reported a good summer season, and also that conditions in the servicing field were improving.

Meeting of September 27

After the usual business of the meeting was disposed of, the Educational Committee reported that plans were being worked out for a series of educational talks, and special invitations will be sent out to practically every service man and organization in the jurisdiction of Northern New Jersey Chapter. Invitations will also be extended to New York Chapter members.

At this meeting Mr. Claude E. Buyers provided entertainment of humorous stories, directed principally at the servicing business.

* * *

Wm. Hunt, Service Manager,
Trupar Manufacturing Co.,
Ohio.

"We are in receipt of a copy of THE REFRIGERATION SERVICE ENGINEER and, after looking over the contents, wish to take this opportunity to congratulate you on putting out such a fine piece of work. It is very helpful and instructive. It goes without saying that it will do a wonderful good in the field in allaying considerable trouble."

SERVICE FALLACIES

THE Herkimer Institute of Refrigeration has been performing a test as follows:

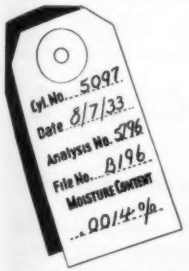
Starting July 6th and twice each day until September 1st, they have charged a sulphur dioxide unit; discharged the unit to a complete vacuum, then sucked in air and built up a pressure to 150 lbs. leaving air in for two hours in the morning and two hours in the afternoon. There is no sign of "sticking up" as yet.

They have arrived at the conclusion that "stick ups" are due mainly:

1. To poor dehydration of the gas by the manufacturer.
2. Impure oil or poorly dehydrated oil.

In other words, the probability of moisture entering the system through outside air is remote.

We are inclined to think that the wet product of some oil dealer or gas manufacturer many years ago was the cause of the original "stick up" and they threw the blame on the poor service man claiming he let in air.



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• • •

ANSUL
SULPHUR DIOXIDE

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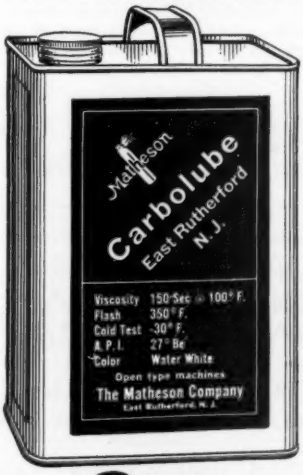
TO facilitate the prompt delivery of Fedders' products in the midwestern territory, Fedders Manufacturing Company, with headquarters at Buffalo, New York, has opened a Chicago office and warehouse at 608 W. Washington Blvd., at which address a complete stock of Fedders' refrigeration appliances is available. This new office is in charge of Mr. Marc Shantz, who is well acquainted in the refrigeration field through his activity in calling upon refrigerator manufacturers and supply houses.

The Fedders' line, including Fedders Non-Frost Commercial Coils, Forced Draft Unit Coolers, Thermostatic Expansion Valves, Evaporators, Condensers, etc., are available for prompt shipment from this address.

The Matheson Co.
East Rutherford, N. J.
REFRIGERATOR



— OILS —

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Will ship any quantity of any refrigerant to any one any where at any time by any route in any ICC cylinder.

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Enjoy five weeks in New York, while learning practical servicing *on all systems*, with tools, not by so called extension, home study, or correspondence school methods.

Sulphur dioxide Ethyl chloride Isobutane F-12 Carrene Methyl chloride Ammonia and other refrigerants

Direct expansion—high pressure float—low pressure float—capillary tube—thermostatic expansion—domestic and commercial systems.

Write for Bulletin R. S. E. for details of the most concise, advanced course to finish your refrigeration education. Are you interested in Oil Burner Servicing? Write for Bulletin O. B. E.

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1819 Broadway, New York City

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See Page 1

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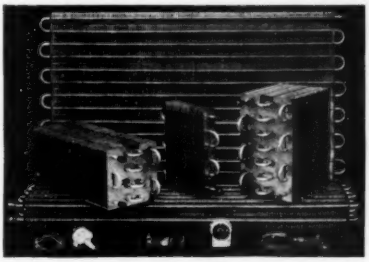
STANDARD REFRIGERATION PARTS CO.
5101 W. Madison St., CHICAGO
AUSTIN 6343



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That describes the quick thrust and withdrawal of heat when a PEERLESS FIN COIL is used. Because the coil is constructed of aluminum fins, with no heavy, solder-encrusted return bends—there is no MASS of metal to cool before cooling the box—and no MASS of metal to warm up before fins can defrost.

Quick Cooling — Quick Defrosting — that is why

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are uniformly successful in all sections of the country.

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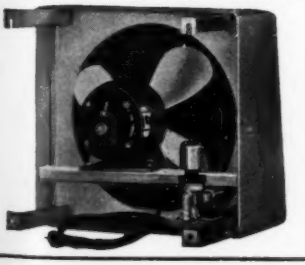

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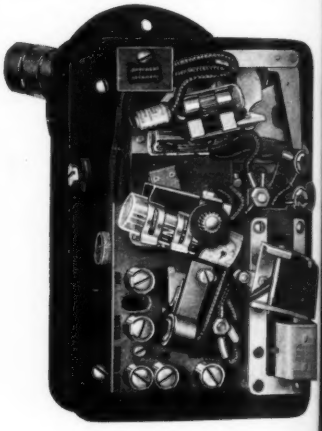

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Type KMRI with safety recycling feature for intermittent ignition.
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